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Manual Transmission for a Motor Vehicle with a Front Transverse Drive

This invention relates to a manual transmission for a motor vehicle with a front transverse drive according to the features of the preamble of Patent Claim 1.

In the state of the art (see European Patents EP 1 067 312 B1 or EP 0 046 373 A1, for example) there are known manual transmission designs having two idler shafts with ratchet wheel pairings that are shiftable accordingly. Each of the two transmission output shafts of a so-called three-shaft transmission is engaged with the gearwheel of an axle differential via a spur gearing. Such transmission designs are used with vehicles with a front transverse drive because they are short and compact in design due to the use of three transmission shafts. The shift gearwheels provided on both transmission output shafts are shifted as needed via locking synchronizers in a rotationally fixed connection to the transmission output shafts. This requires gearshift forks that act on the gearshift sleeves of the synchronizing units and are mounted on corresponding shift axles. In the case of a non-automatic manual transmission, gearshift lever shafts are necessary for selecting and operating the gearshift forks.

The object of this invention is to develop a space-saving and compact bearing for the shift axles and the gearshift lever shaft for a generic manual transmission.

This object is achieved by the features characterized in Claim 1.

Due to the fact that a common bearing unit which is provided for the bearing and/or accommodation of the shift axles and the gearshift lever shaft is arranged between the wheel set and the central receptacle opening in the differential spur gear, the total design space can be further reduced in comparison with known transmission designs.

Advantageous embodiments and refinements of this invention are possible through the measures characterized in the subclaims.

The bearing unit designed as a bearing bridge has a total of three bearing eyes which serve to accommodate the two shift axles and the gearshift lever shaft.

The bearing bridge is arranged in a space-saving manner between the wheel

set and the differential spur wheel, so that it at least partially bridges the latter.

To minimize the design size, it is proposed that the bearing bridge be designed as a profile element which is provided with two offset fastening straps at its two ends.

An exemplary embodiment of this invention is explained in greater detail in the following description and is illustrated in the drawing.

FIG 1 shows the wheel set arrangement of a three-shaft transmission;

FIG 2 shows a perspective view of the transmission with the wheel set and the shift arrangement;

FIG 3 shows a first view of the gearshift;

FIG 4 shows a second view of the gearshift; and

FIG 5 shows a bearing unit for the shift axles in the main gearshift lever shaft.

FIG 1 shows the wheel set arrangement of a three-shaft transmission in an "exploded" diagram which does not show the exact spatial relationship, in which two transmission output shafts 4 and 6 are provided in addition to a transmission input shaft 2, both of the output shafts being connected to a spur wheel 12 of an axle differential 14 via a gearwheel 8 and 10. The axle bevel gears 16a and 18a which drive the two axles shafts 16 and 18 as well as the two differential bevel pinions 19 and 20, which are in engagement with the axle bevel gears 16a and 18a, are arranged in the differential housing 14a in a known manner.

The loose wheels 22 and 24 for the gears 1 and 2, which are arranged on the first transmission output shaft 4, can be connected in a rotationally fixed manner to the transmission output shaft 4 with the help of a first locking synchronizer 26. The two loose wheels 22 and 24 each engage with one of the ratchet wheels 27 and 28 arranged on the transmission input shaft 2. The loose wheels 29 through 32 are arranged on the second transmission output shaft 6, with the loose wheels 29 and 30 cooperating with a second locking synchronizer 33 for switching the third and fourth gears and the loose wheels 31 and 32 cooperating with a third locking synchronizer 34 for shifting the gears 5 and 6. All four loose wheels mounted on the transmission output shaft 6 engage with ratchet

wheels mounted on the transmission input shaft 2: the loose wheel 29 with the ratchet wheel 35, the loose wheel 30 with the ratchet wheel 28, the loose wheel 31 with the ratchet wheel 36 and the loose wheel 32 with the ratchet wheel 37. For reversing into a reverse gear, a fourth transmission axle 38 is provided for reversing the direction of rotation, with a gearwheel 39 having two gearwheel rings 39a and 39b rotationally mounted on it side by side. The loose wheel 40 for the reverse gear arranged on the transmission output shaft 4 is engaged with the second gearwheel ring 39b of the gearwheel 39, with the ratchet wheel 36 which is arranged on the transmission input shaft 2 being engaged with the first gearwheel ring 39a of the gearwheel 39. The loose wheel 40 is in turn connected in a rotationally fixed manner to the transmission output shaft 4 via a fourth locking synchronizer 41 in case of need.

For axial displacement of the locking synchronizers 26, 33, 34 and 41 arranged on the two transmission output shafts 4, 6 as illustrated in FIG 3, for example, four gearshift forks 42 through 45 are provided, engaging in a known manner in gearshift sleeves of the locking synchronizers. The two shift axles 46 and 48 are provided for the bearing of the gearshift forks 42 through 45, with gearshift forks 42 and 45 and/or the gearshift forks 43 and 44 being displaceably mounted on the axles. For the bearing of the two shift axles 46 and 48, a bearing unit 50 which is designed as a bearing bridge is provided; it is mounted on the transmission housing 54 with the help of two mounting straps 51 and 52 which are designed with an offset. On the upper end of the bearing bridge 50, the two bearing eyes 55 and 56 are provided, accommodating the two gearshift axles 46 and 48. For selecting and operating the gearshift forks 42 through 45, a single main gearshift lever shaft 58 is provided, the latter also being mounted on and/or in the bearing bridge 50 at its one end. To do so, a third bearing eye 60 is provided on the lower end of the bearing bridge 50, aligned essentially perpendicular to the two first bearing eyes 55 and 56. At its upper end, the main gearshift lever shaft 58 is mounted in a housing cover 62, which is in turn mounted on a transmission housing cover (not shown) which is flange-connected to the transmission housing 54. The selector and gearshift mechanism (not shown) for a translational and rotational movement of the main gearshift lever shaft 58 is integrated into the housing cover 62. For selecting and operating the individual gearshift forks 42 through 45, a gearshift finger 64 is provided on the main gearshift lever shaft 58, engaging in a shift opening in the corresponding gearshift fork according to the preselected axial position of the main gearshift lever shaft 58. A rotational movement of the main gearshift lever shaft 58 to the right or left causes an axial displacement of the selected gearshift fork by

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which a locking synchronizer assigned to the particular loose wheel is activated. As shown in FIG 2, the bearing bridge 50 is arranged in a space-saving manner between the wheel set (the transmission input shaft 2, the transmission output shaft 4 and 6) and the central opening 66 in the axle differential 14 through which the axle shaft 16 passes.